Development of protocols to identify and evaluate critical ecosystems

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Background

Defining and identifying areas that support ecosystems critical to the health of a region is an important but difficult task. Critical ecosystems are those that are fully functional and provide amenities and services that are necessary to sustainable human activities. Currently, these ecosystems are identified using best professional judgment, and this judgment is rarely verified through independent methods.

The Critical Ecosystems Team in the USEPA's Region V has already used Geographic Information Systems (GIS) technology and best professional judgment to create a spatially explicit database of critical ecosystems in the Region (see Figure 1). The Regional map was created by overlaying many different datasets that described ecological characteristics in three broad categories: diversity, sustainability and rarity.

We are using two different methods to check the veracity of this GIS map. First, field data will be collected throughout the Region that will provide an independent assessment of the quality of the areas on the ground. The field data will be collected during the summer of 2004 using "quick assessment protocols," developed and tested by a group of ecologists throughout the Region. Second, ORD will use an index based on Fisher Information to identify areas of transition from high to low quality (red to white on Figure 1).

Figure 1. Critical ecosystems in USEPA Region V.

Protocols

In June 2003, a group of over 20 experts from throughout Region V met at Region V headquarters for a three-day protocol development meeting. The group designed four protocols, that could be executed by four people in four hours per each 300 m by 300 m plot, that covered each of four broad habitat types: lakes, wetlands (emergent and forested), nonforested terrestrial (prairies, shrublands, and dunes), and forested terrestrial (deciduous, mixed, and coniferous).

In April 2004, over 35 experts from around the Region meet for a three-day protocol field testing meeting in Bloomington, IN. Teams of four visited plots around the Bloomington area to test the feasibility of the protocols, and to determine how best to analyze the data to determine the habitat quality in a plot (see Figure 2). Data on plants, soil, animals, and evidence of human activities were collected.

The methodology proposed here, to identify critical ecosystems using both remote sensing and field data collected throughout the Region, will be transferable to all other EPA Regions. All Regions are currently facing rapid urbanization, with loss of both agricultural and natural areas that once served to mitigate for urbanization effects (such as increased flood events, air pollution, etc.). Identifying these remaining critical ecosystems is important, as these areas will have a high conservation and management priority. The emphasis on including local experts to develop field data collection techniques will insure that the types of data collected are appropriate for the Region and state natural resource trustee agencies.

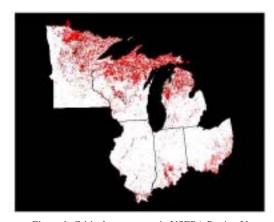Figure 2. Dr. Alice Heikens of Franklin College (IN) and Dr. Roger Anderson of Illinois State University identify grassland plants in a quadrat.